

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT (PCT Article 36 and Rule 70)

REC'D 21 MAY 2004

Applicant's or agent's file reference FE 6006	FOR FURTHER ACTION		See Notification of Transmittal of International Preliminary Examination Report (Form PCT/PEA/416)
International application No. PCT/EP 03/02299	International filing date (day/month/year) 05.03.2003	Priority date (day/month/year) 12.03.2002	
International Patent Classification (IPC) or both national classification and IPC C08L23/10, C08L23/10			
Applicant BASELL POLIOLEFINE ITALIA S.P.A.			

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 5 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 3 sheets.

3. This report contains indications relating to the following items:

I ☒ Basis of the opinion

II ☐ Priority

III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

IV ☐ Lack of unity of invention

V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

VI ☐ Certain documents cited

VII ☐ Certain defects in the international application

VIII ☐ Certain observations on the international application

Date of submission of the demand 05.09.2003	Date of completion of this report 21.05.2004
Name and mailing address of the international preliminary examining authority: European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016	Authorized Officer Bergmans, K Telephone No. +31 70 340-4189



**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. **PCT/EP 03/02299**

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, Pages

2-14 as originally filed
1 received on 08.04.2004 with letter of 08.04.2004

Claims, Numbers

1-14 received on 08.04.2004 with letter of 08.04.2004

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
☐ the language of publication of the international application (under Rule 48.3(b)).
☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
☐ filed together with the international application in computer readable form.
☐ furnished subsequently to this Authority in written form.
☐ furnished subsequently to this Authority in computer readable form.
☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
☐ the claims, Nos.:
☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

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**INTERNATIONAL PRELIMINARY
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International application No. **PCT/EP 03/02299**

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability;
citations and explanations supporting such statement**

1. Statement

Novelty (N)	Yes: Claims	
	No: Claims	1-14
Inventive step (IS)	Yes: Claims	
	No: Claims	1-14
Industrial applicability (IA)	Yes: Claims	1-14
	No: Claims	

2. Citations and explanations

see separate sheet

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/EP 03/02299

Re Item 1

Basis of the opinion

All amendments are allowable under article 19(2)PCT

Re Item V

Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Novelty (Art. 33 (2) PCT)

1. The document D1 (**US5360868**) discloses a polyolefin polymer composition (claim 1) comprising an olefin composition comprising

A) (25-50 wt% based on 10-80 wt%) a crystalline copolymer of propylene with ethylene having an ethylene content between 0.5-3 % and a solubility in xylene lower than 4 %

B) (50-75 wt% based on 10-80 wt%) a copolymer of ethylene and C4-C8 alpha olefin wherein the alpha olefin content is between 10- 20 % and the solubility of the copolymer in xylene is between 10-40 %.

C) and a propylene composition containing (40-80 % based on the 10-80 % by weight) an ethylene and propylene copolymers containing 20-40 % ethylene, the copolymer is soluble in xylene and has a intrinsic viscosity between 1.7-3 dl/g

The described compound A) is identified as A in the present application, compound B is B(2) in the present application, and compound C is identified as B(1) in the present application. The composition is prepared in a sequential polymerisation in two or more stages using a catalyst comprising trialkylaluminum, electron donor and a solid catalyst compound (Column 4 line 67). The subject matter of claims 1-14 over D1 is considered to be not novel (Art. 33(2) PCT), since the difference in intrinsic viscosity (compound B) is not shown (comparative examples).

2. The document D2 (EP0412534) discloses a propylene polymer composition comprising A) a propylene ethylene random copolymer containing not more than 10 mole % ethylene and has a solubility lower than 5 % by weight in xylene.

B) (5-40 wt % based on A+ B) an ethylene-propylene random copolymer containing 30-75 wt% propylene and not more than 5 wt % of the copolymer is insoluble in xylene

C) (17-40 wt% based on A+B+C) an ethylene-propylene copolymer containing 10 to 40 wt % propylene and is characterised by a Mooney viscosity of 10 to 100 (claim 6).

The difference is the copolymer of ethylene with the alpha olefin of formula $H_2C=CHR^2$ wherein R2 is e.g. linear or branched alkyl.

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**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/EP 03/02299

3. The document D3 (WO0011057) discloses a process for the preparation of heterophasic polyolefin compositions. The heterophasic polyolefin comprises a crystalline propylene matrix and an elastomeric copolymer of ethylene with an alpha olefin. The composition are used in cast film applications. The difference is the copolymer of ethylene with the alpha olefin of formula $H_2C=CHR^2$ wherein R^2 is e.g. linear or branched alkyl.

Inventive step (Art. 33(3) PCT)

All the technical features of the present claims 1-14 are described in D1. Moreover, D1 relates to a composition comprising copolymers wherein the composition is characterised by improved properties. Therefore the claims 1-14 do not involve an inventive step (Art. 33(3) PCT).

Re Item VIII

Certain observations on the international application

Clarity (Art. 6 PCT)

This finding related to claim 10 might be different under certain national / regional law e.g. EPC.

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POLYOLEFIN COMPOSITIONS HAVING HIGH FLUIDITY

FIELD OF THE INVENTION

The present invention concerns polyolefin compositions having improved fluidity, softness and free of gels, which can be advantageously used for producing films and sheets, and in particular cast films. These compositions may be obtained by a sequential polymerization process.

PRIOR ART DISCLOSURE

Polyolefin compositions having elastic properties, as well as good mechanical and optical properties have been used in many application fields, due to the characteristics which are typical of polyolefins (such as chemical inertia, mechanical properties and nontoxicity); moreover, these compositions show outstanding cost/performance ratios.

In the state of the art, elastic polypropylene compositions retaining a good mechanical behavior has been obtained by way of sequential copolymerization of propylene, optionally containing minor quantities of olefin comonomers, and then ethylene/propylene or ethylene/alpha-olefin mixtures. Catalysts based on halogenated titanium compounds supported on magnesium chloride are commonly used for this purpose.

For instance EP-A-400 333, in the name of the same Applicant, describes elastoplastic polyolefin compositions, obtained by sequential polymerization, comprising:

- A) 10-60 parts by weight of a crystalline polymer or copolymer of propylene;
- B) 10-40 parts by weight of a polymer fraction containing ethylene, insoluble in xylene at room temperature; and
- C) 30-60 parts by weight of an ethylene/propylene copolymer fraction, soluble in xylene at room temperature.

These compositions do not show satisfactory flexibility and elastic properties, as demonstrated by the flexural modulus values (comprised between 200 and 700 MPa); moreover, they do not have satisfactory optical properties, such as transparency.

EP-A-472 946, in the name of the same Applicant, describes flexible polyolefin compositions comprising, in parts by weight:

- A) 10-50 parts of an isotactic propylene homopolymer or copolymer;
- B) 5-20 parts of an ethylene copolymer, insoluble in xylene at room temperature; and
- C) 40-80 parts of an ethylene/propylene copolymer containing less than 40% by weight of ethylene and being soluble in xylene at room temperature; the intrinsic viscosity of said

US 5,360,868 describes polyolefin compositions comprising (A) a propylene homopolymer or a crystalline copolymer of propylene and ethylene or C₄₋₈ α-olefin, (B) an olefin polymer composition, and optionally either, (C) a propylene polymer composition or (D) a olefin polymer rubber. The olefin polymer (B) and the propylene polymer (C) can be prepared by sequential polymerization

CLAIMS

1. A polyolefin composition comprising:

(A) from 15 to 40% by weight of a crystalline copolymer of propylene with at least one alpha-olefin of formula $H_2C=CHR^1$, where R^1 is H or a C_{2-8} linear or branched alkyl, containing at least 90% by weight of propylene, having solubility in xylene at room temperature lower than 15% by weight;

(B) from 60 to 85% by weight of an elastomeric fraction comprising:

(1) a copolymer of propylene with ethylene, optionally containing 0.5 to 5% by weight of a diene, containing from 20 to 35% by weight ethylene, and having solubility in xylene at room temperature greater than 45% by weight, the intrinsic viscosity of the xylene soluble fraction ranging from 1.0 to 3.0 dl/g; and

(2) a copolymer of ethylene with at least one alpha-olefin of formula $H_2C=CHR^2$, where R^2 is a C_{2-8} linear or branched alkyl, optionally containing 0.5 to 5% by weight of a diene, containing 15% to 40% by weight alpha-olefin, and having solubility in xylene at room temperature greater than 35% by weight, the intrinsic viscosity of the xylene soluble fraction ranging from 1.0 to 3.0 dl/g;

the (1)/(2) weight ratio ranging from 1:5 to 5:1.

2. The polyolefin composition according to claim 1, wherein the amount of the crystalline copolymer (A) ranges from 20 to 35% by weight.

3. The polyolefin composition according to claim 1 or 2, wherein the crystalline copolymer (A) contains at least 95% by weight of propylene and has solubility in xylene at room temperature lower than 10% by weight.

4. The polyolefin composition according to claim 1 wherein, in the crystalline copolymer (A), said alpha-olefin is ethylene.

5. The polyolefin composition according to claim 1, wherein the copolymer (1) of fraction (B) contains from 25 to 30% by weight ethylene and has solubility in xylene at room temperature greater than 50% by weight, the intrinsic viscosity of the xylene soluble fraction ranging from 1.5 to 2.5 dl/g.

6. The polyolefin composition according to claim 1, wherein the copolymer (2) of fraction (B) contains from 20 to 35% by weight alpha-olefin and has solubility in xylene at room temperature greater than 40% by weight, the intrinsic viscosity of the xylene soluble fraction ranging from 1.5 to 2.5 dl/g.

7. The polyolefin composition according to claim 1 or 6 wherein, in the copolymer (2) of

fraction (B), said alpha-olefin is 1-butene, 1-hexene or 1-octene.

8. The polyolefin composition according to claim 1, having a flexural modulus ≤ 130 MPa, Shore D hardness ≤ 40 , and MFR ≥ 1.5 g/10min.
9. The polyolefin composition according to claim 8, wherein the flexural modulus is ≤ 100 MPa, Shore D hardness ranges from 25 to 35, and MFR is ≥ 2.0 g/10min.
10. The polyolefin composition according to claim 1, wherein the composition is obtainable by sequential polymerization in at least three stages, carried out in the presence of a catalyst comprising a trialkylaluminum compound, optionally an electron donor, and a solid catalyst component comprising a halide or halogen-alcoholate of Ti and an electron-donor compound supported on anhydrous magnesium chloride.
11. A process for the preparation of a polyolefin composition as claimed in claim 1, comprising at least three sequential polymerization stages with each subsequent polymerization being conducted in the presence of the polymeric material formed in the immediately preceding polymerization reaction, wherein the crystalline copolymer (A) is prepared in at least one first stage, and the elastomeric polymer fraction (B) is prepared in at least two sequential stages, all polymerization stages being carried out in the presence of a catalyst comprising a trialkylaluminum compound, optionally an electron donor, and a solid catalyst component comprising a halide or halogen-alcoholate of Ti and an electron-donor compound supported on anhydrous magnesium chloride, said solid catalyst component having a surface area (measured by BET) of less than $200 \text{ m}^2/\text{g}$, and a porosity (measured by BET) greater than 0.2 ml/g .
12. The process according to claim 11, wherein the sequential polymerization stages are all carried out in gas phase.
13. Films and sheets comprising the polyolefin composition of claim 1.
14. A cast film comprising the polyolefin composition of claim 1.